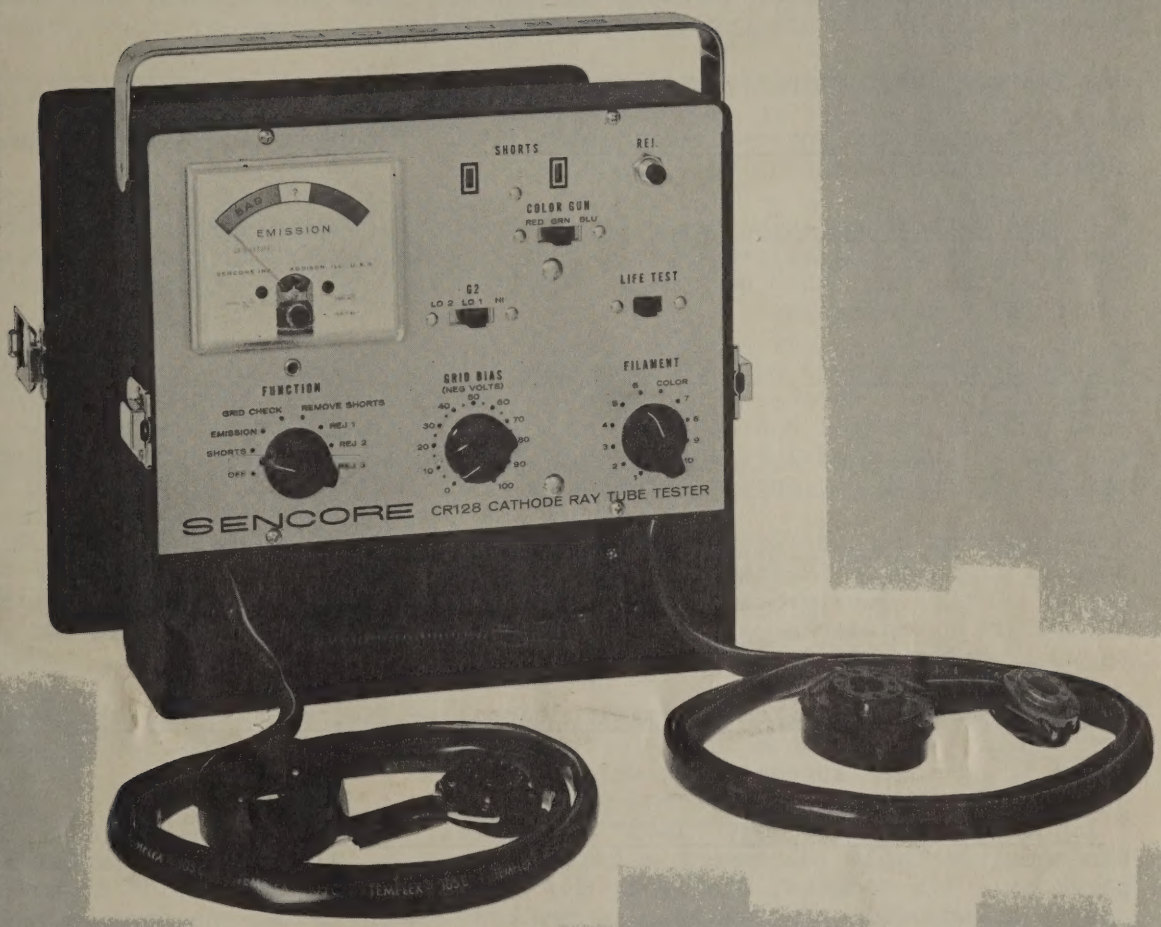


INSTRUCTION MANUAL FOR THE SENCORE CR128 CRT TESTER AND REJUVENATOR

INSTRUCTION MANUAL FOR THE SENCORE CR128

CRT TESTER AND REJUVENATOR

The Sencore CR128 tester is designed to accurately and reliably test and rejuvenate all TV picture tubes, including color.

New features that simplify testing and rejuvenation are as follows:

* High sensitivity inter-element short test. Two neon lights clearly indicate shorts leakage or gas up to 25 megohms.

* Checks cathode emission using DC. Unlike other testers that use direct AC, the CR128 uses well filtered DC on all elements, except filament, providing a more reliable test that correlates directly with the RCA, GE, Sylvania and other CRT tube manuals.

* Checks control grid cut-off characteristics more reliably to insure proper contrast ratio. Because DC voltage is employed, rather than AC, the control grid cut-off control can be calibrated directly in negative volts, thus corresponding to tube manual "raster cut-off voltage". Cut-off voltage is listed in the set-up chart for easy reference.

* Rejuvenates cathode with Automatic Controlled Timing. Rejuvenation voltage is applied through an RC time controlled circuit to reduce accidental over-rejuvenation or tube damage. As CRT conducts, the time circuit discharges so as not to over-rejuvenate the cathode. A quick check of the Cathode Emission will determine whether additional reactivation is necessary.

* Welds open cathode with Automatic Controlled Timing using capacity welding principle. This Sencore first feature often prevents "opening up" a cathode after it has been successfully welded.

* Light-weight, no "draggy" leads and no messy adaptors to lose. The CR128 is a handsome, portable instrument weighing less than 10 pounds with handy lead compartment. Six sockets, including the all new miniaturized color socket, are neatly arranged on two cables, one for color sockets and one for black and white sockets.

FAMILIARIZING YOURSELF WITH THE CR128 CONTROLS

FILAMENT CONTROL. This control selects the proper AC filament voltage for the tube under test. It's voltage is 1v, 2v, 3v, 4v, 5v, 6v, (6.3v), 7v, 8v, 9v, 10v, 12v. This is set up from the set-up chart.

G-2 SWITCH. This switch is used to select the proper B plus voltage to the G2 electrode. Some tubes are designed to operate with a first anode potential of only 50 volts. Some later tubes have a G2 voltage as low as 30v. If these tubes are tested in the LO-1 position, emission indication will be above normal. An LO-1 or LO-2 G2 type tube can be damaged if it is operated with the switch in Hi position. This is common to all modern CRT testers and is set from the set-up chart.

FUNCTION SWITCH. The Function Switch is arranged for normal sequence of testing and/or rejuvenating from left to right, as follows: OFF, SHORTS, EMISSION, GRID-CHECK, REMOVE SHORTS, REJUVENATE 1, REJUVENATE 2, and REJUVENATE 3.

BIAS ADJUST. This control tells you the voltage at which the tube under test "cuts off". It actually cuts off the tube beam current. This is an important factor in determining the contrast range of a picture tube.

HANDY STORAGE COMPARTMENT. A storage place has been provided for all the necessary cables and cords. Your unit may be used either horizontally or standing up. There are no tubes to wear out and cause miscalibration.

LIFE TEST SWITCH. This switch is used to approximate the probable life of a tube and to aid in determining whether or not the tube is filament voltage sensitive or not.

COLOR GUN SELECTOR. As the name implies, this is used to select each of the three guns in a color tube so as to evaluate or rejuvenate each gun separately. This control is inactive when checking black and white cathode ray tubes and can be left in any position.

REJUVENATE BUTTON. This is a push switch which applies the rejuvenation and removes shorts voltage to the CRT when depressed. (Use REJ 1 ONLY, for LO-1 and LO-2 G2 tubes.)

SHORT AND GAS INDICATORS. These are the two high sensitivity interelectrode short indicators. If either of the indicators glow or flash steadily, a leakage path exists between the CRT elements.

EMISSION INDICATOR. The emission indicator is a sensitive 500 microamp meter movement that will indicate the amount of emission of a CRT. It also is used to indicate when the tube is cut-off when used with the bias control in the GRID CHECK position.

PILOT LIGHT. Lets you know when the CR128 is on.

USING YOUR CR128 CATHODE RAY TUBE TESTER

Follow this step by step procedure for best results.

1. Set up tester from set-up chart. Note that the set-up chart lists information as follows: Tube type, Filament voltage, G2, and Grid Bias. Locate the tube number that you intend to test, set the FILAMENT and G2 switches to the settings listed in the set-up chart.

2. Select the proper CRT socket. Install the socket that fits the tube. The only exception is the socket marked "special". This socket is also a different color. If this special socket is to be used, it is clearly marked in the set-up chart as "use special socket" directly under the tube set-up information for that tube.

3. Check for shorts, leakage, high gas content. This test should always be made first. Set the SELECTOR SWITCH to SHORTS. Allow a few minutes for the CRT to warm up. If inter-elements shorts or leakage exists, one or both of the neon lights, designated as SHORTS on the panel, will glow or flicker. A bright glow indicates a direct short. A flicker indicates high leakage or gas content. If a dead short exists, do not proceed with the emission or grid check before shorts are removed (if they can be removed), as excessive current can damage the meter. Further, any readings that would be obtained would be erroneous.

4. Remove Inter-Element Shorts. If you have determined that a short exists, it may be possible to remove it. The most likely shorts are from heater to cathode and cathode to control grid. It is not recommended that any attempt be made to remove heater to cathode shorts as it will only aggravate the condition. Therefore, the CR128 is designed to remove control grid to cathode shorts only. The following chart will assist you in determining where the short exists.

Left Light	Right Light	Condition
Does not light	Does not light	No shorts
Glows	Does not glow	Heater-cathode short or leakage from 0 to 8 megohms.
Glows	Glows	Cathode to control grid (G1) short or leakage up to 16 megohms.
Glows	Does not glow	Cathode to G2 short or leakage up to 8 megohms.
Does not glow	Glows	G1 to G2 shorts or leakage up to 8 megohms.

Note that the chart indicates only "glow" or "does not glow". The lights may glow brightly, dimly or just flash. The brighter the light, the more severe the short. Because of the high sensitivity of the shorts indicators, some tubes may continue to work when "flashing" only exists. However, the flashing is an indication that the tube is going bad and that more than normal leakage exists. From the above chart, note that heater to cathode and G2 to cathode shorts appear the same. If the short indicator glows on the left and not on the right, it should be realized that a short between G2 and cathode is very remote and that in almost all cases, a short between heater and cathode should be suspected. Installation of an isolation transformer on the CRT when in the TV set is the only answer to this problem (other than replacing the CRT).

If a cathode to control grid short or leakage exists, set the FUNCTION switch to REMOVE SHORTS and depress the REJ button. A flash may occur in the neck of the tube. The Automatic Timing circuit will prevent you from applying voltage for too long a period as no voltage is being applied to the CRT elements after a flash in the neck. To re-apply voltage, you must release and depress the REJ button again.

As a safeguard, it is recommended that about 30 seconds be allowed between the time the FUNCTION switch is switched from SHORTS to REMOVE SHORTS to cool the filament which has automatically been disconnected.

From a practical standpoint for field expediency, the operator does not need to refer to the above chart. He merely notes one or both of the SHORTS indicators glowing and switches to REMOVE SHORTS and depresses the REJ button after 30 seconds. Returning to SHORTS position will quickly tell whether or not the short has been removed. If a short exists other than control grid to cathode, no harm can be done on the REMOVE SHORTS position as no voltage is applied to the other elements.

CAUTION: If the tester is used without reference to the chart as described above, care should be taken as the FUNCTION switch is rotated through EMISSION and GRID-CHECK as meter damage can occur. To prevent this, rotate the GRID BIAS control to Zero or pull the socket from the CRT.

Many open elements and shorts, especially dead shorts, can be traced to the base of the CRT. These can be repaired by unsoldering the pins, and carefully separating the shorted wires, or resoldering the pins, whichever the case might be.

EMISSION TEST

Before performing this test, make sure that the G2 switch is in the proper position as failure to use low G2 on tubes which require it could cause the beam current to rise to a value which may destroy the tube. If there are no (dead) shorts, then rotate the FUNCTION switch to emission. The needle will give an accurate indication of the emissive qualities of the tube. The CRT is checked with DC and the true beam current is measured directly. The true beam current is the current which actually passes through the G1 aperture and is accelerated to eventually strike the front of the picture tube in the TV set. Notice that the meter is divided into 3 portions: Bad, Questionable and Good. 0 to 200 microamps is inadequate to produce a usable bright picture and is calibrated as BAD. The questionable area is 200 microamps to 300 microamps. Above 300 microamps is a good usable tube. The high end of the Good area on the meter scale is suppressed in order that a "new" tube will not drive the needle off scale and accuracy is still maintained in the lower 3/4 of the scale. A new tube will usually measure 900 microamps to 1500 microamps.

LIFE TEST

The probable life of a CRT can be approximated by noting how quickly the emission falls to zero after the life switch is depressed. This is illustrative of the amount of emitting material left on the cathode, and the gas content of the tube. If the needle falls rapidly to zero, the probable life will be short. After practicing on a few good and bad tubes, the technician will soon become familiar with the action of the meter. Tubes which drop off quickly, with this test, are probably filament voltage sensitive, also.

GRID BIAS CHECK

If no shorts exist and the cathode current readings are satisfactory, proceed with the grid bias check. This check determines three things: an open control grid, action of the control grid, and the point where the beam current is cut-off.

Switch the FUNCTION switch to GRID CHECK. Starting with the GRID BIAS control at zero, increase the negative volts clockwise and note the action of the meter. It should "drop off" gradually as the bias is increased. Increase the setting until the meter pointer rests on the line marked CUT OFF. Do not increase beyond this point. Read the negative volts required for cut-off from the GRID BIAS control and compare to the set-up chart. Note that a voltage range is given in the set-up chart. If the tube cuts off in this range, it is satisfactory. If cut-off cannot be obtained, G2 switch may be set too high. Check whether this switch is set correctly from set-up chart.

RESTORATION OF EMISSION BY REJUVENATION

If the CR128 indicates low emission, increase the setting of the FILAMENT control and remeasure EMISSION. If emission rises to the GOOD area, a tube brightener should be installed. It is not recommended that rejuvenation be used if a brightener will do the job.

If a brightener is not desired by you or the customer or if a brightener installation is not indicated by the above test, the CRT should be rejuvenated.

Rejuvenation is a process of accelerating the beam current and/or increasing filament voltage temporarily so as to bring to the cathode surface new emitting material and to enlarge the aperture in the control grid.

Three degrees (steps) of rejuvenation are available on your CR128. REJ 1 position applies normal filament voltage and applies high voltage to the control grid. This voltage is automatically timed to prevent over-rejuvenation, no matter how long the REJ button is held down. To use the REJ 1, set the FUNCTION control to REJ 1 and push the REJ button. You can hold down the button as long as you desire. However, if you release the button and depress it again, you will apply another cycle of rejuvenation voltage. After one rejuvenation cycle, check EMISSION and GRID CHECK again to determine whether or not the tube has returned to normal. If the EMISSION reads in the GOOD area, do not continue rejuvenation to try to improve the tube as tube damage can result. DO NOT attempt to rejuvenate LO-1 and LO-2 G2 tubes in the REJ 2 and REJ 3 positions as tube damage can occur.

If good results cannot be obtained using REJ 1, follow the same procedure as above, except for LO G2 tubes, setting the FUNCTION switch to REJ 2, and then REJ 3, if necessary. In REJ 2, the filament voltage is increased. In REJ 3 position, the filament voltage is further increased and the timing cycle lengthened. CAUTION: Be sure that the FILAMENT switch is in the position indicated in the set-up chart during rejuvenation.

CATHODE WELDING

When a CRT has absolutely no emission and the heater is still lit, the tube probably has an open cathode. If this is indicated after re-soldering the CRT base pins, then the procedure for welding an open cathode tab should be followed.

For high G2 tubes only, rotate the function switch to REJ 3 position. Allow the tube to warm up for about thirty seconds.

Now depress the "REJ" button. If no flash occurs, depress the REJ button again and tap the neck of the tube while the REJ button is depressed. If a flash occurs, release the REJ button and test for emission. If no flash occurs, the tube cathode cannot be welded.

Keep in mind that the Sencore CR128 is the only tester and rejuvenator that will prevent welding and then open again, before the rejuvenate cutton can be released. Once the arc has occurred in the tube, no additional voltage is applied unless the button is released and depressed again. Therefore, it makes no difference how long the REJ button is held down.

REJUVENATE BUTTON SWITCH ARCING: You may note arcing in the switch behind the REJ button during some tests. This switch is a specially built "leaf type" designed to withstand this arc.

HERE IS HOW THE SENCORE CR128 TIMING CIRCUIT WORKS

An age old problem of over-rejuvenation, opening elements that have successfully been welded and un-even rejuvenation of guns in tri-color picture tubes has been solved by Sencore engineers with a special RC timing circuit. This timing circuit virtually "thinks for itself" allowing the operator to depress the rejuvenate button for any length of time with the result that just the right amount of voltage (and thus current) is applied for the right amount of time.

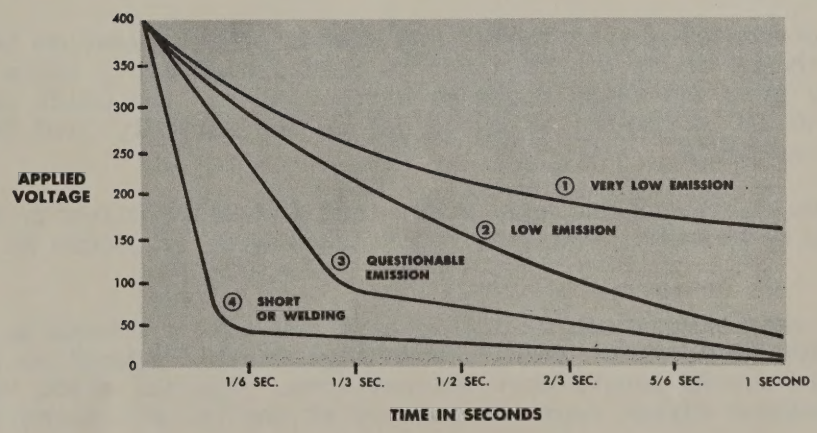
Let us look at four different tubes with four different troubles or tests to see how the timing circuit works.

Case No. 1. This is a tube that has very low emission. It requires rejuvenation voltage for a longer period of time to bring it into the GOOD area. The RC timer automatically applies voltage for an extended period to do the job.

Case No. 2. This is a CRT that has low emission and requires average rejuvenation time. The RC timer automatically applies the voltage for just the right amount of time.

Case No. 3. This is a tube that has nearly adequate cathode current and, therefore, requires less rejuvenation. The rejuvenation voltage is automatically applied for a shorter period, thus preventing over-rejuvenation.

Case No. 4. This is a tube that exhibits a short. Naturally, applying rejuvenation voltage for too long a period may destroy the CRT and damage the tester. The CR128, unlike other testers, automatically prevents this from happening. Note the cathode welding action is the same, preventing opening the cathode if it has been welded. This is the same action as used on a capacity welding machine.



COLOR PICTURE TUBES

The CR128 design has taken color picture tube testing into consideration very carefully, offering new and more reliable features. Each gun in the tri-color tube is tested and/or rejuvenated separately. This allows you to treat each gun as a separate tube. If all three guns need rejuvenation, the automatic timing circuit will aid in bringing each gun more into line than a manually operated system and, thus, making it easy to achieve white. It may be that the red gun on the older type tubes is the only gun that requires rejuvenation.

It should be noted that two color sockets are available on the CR128, thus equipping you for the new type color tubes.

NEW CRT SET-UP CHARTS

New set-up charts will automatically be sent to you if you sign and return your warranty card. New charts are available semi-annually.

If you desire, new set-up data can be obtained by merely referring to an up to date tube manual. The CR128 operates directly from the specifications given in any of these manuals. You will need only three figures; filament voltage, control grid cut-off range and G2 voltage. All three are listed in the manual. As a matter of fact, if you desire, the CR128 can be operated without a set-up chart if you carry your tube manual on service calls.

OBSOLESCENCE

The latest sockets have been supplied with your CR128. There are no future CRT sockets proposed at this time. If a new type socket should be announced, a simple adaptor will be available from Sencore. Since the CR128 can be operated directly from a tube manual, it is virtually impossible to obsolete this unit. In determining the CRT socket to use, use the socket that fits except on small eight pin socket. If G2 is pin 2 on basing diagram in tube manual, use the SPECIAL socket.

SERVICE AND WARRANTY

You have just purchased one of the finest pieces of equipment on the market. However, even though there are no tubes to need replacement, there is always the possibility that something could go wrong. If so, the CR128 is covered by a standard 90 day warranty, as explained on the warranty card that was shipped with your CR128.

For best service on out of warranty work, send the CR128 directly to the factory service department. Be sure to indicate what you found in need of repair.

If you wish to repair your own CR128, we have included a schematic and a parts list of the most needed parts. A voltage check compared to the voltages on the schematic should locate most malfunctions. Special exact replacement parts may be ordered direct from the factory at the prices listed in the price list.

We reserve the right to examine the defective components before a No Charge replacement is issued.

METER CALIBRATION

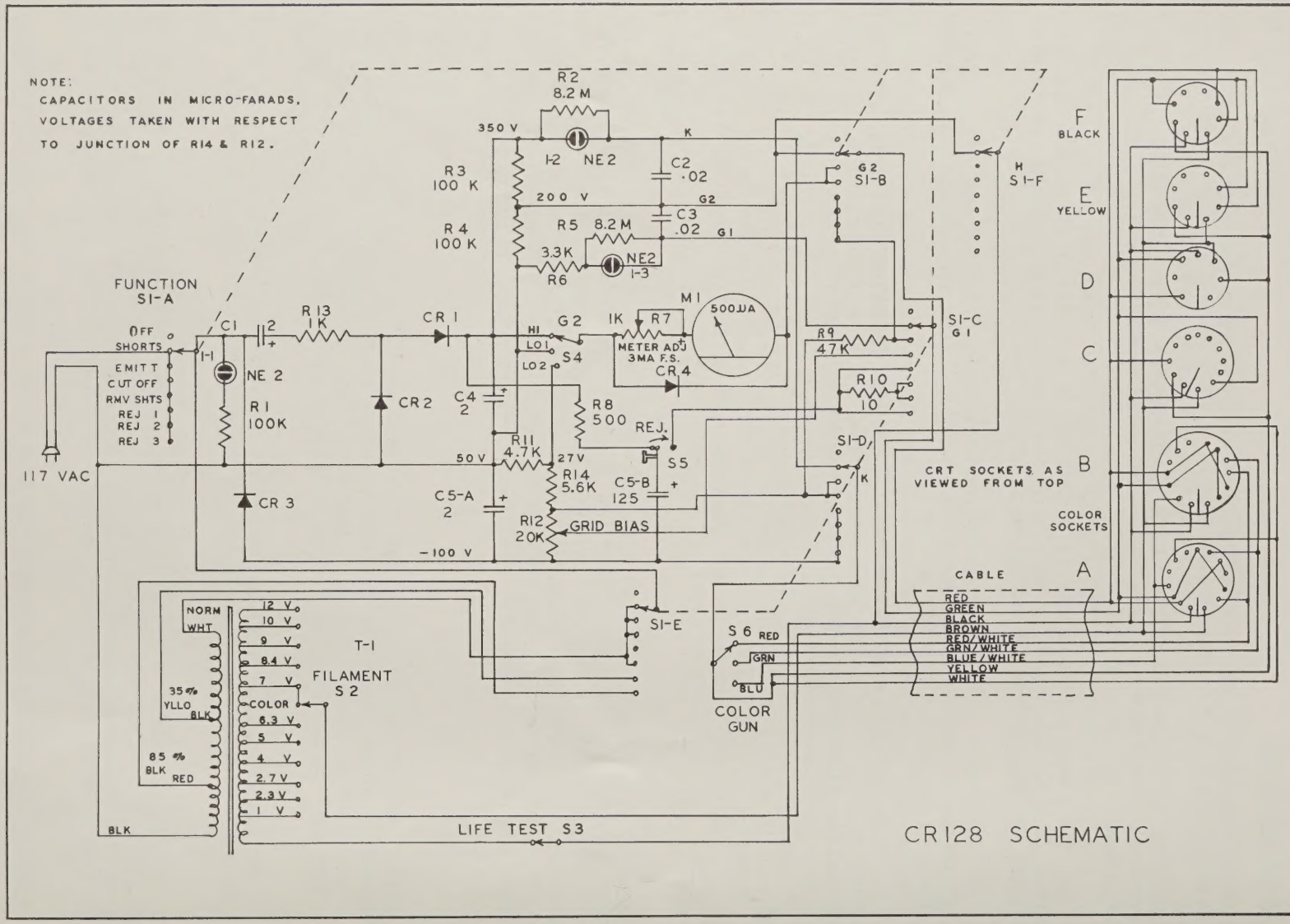
The meter in your CR128 is a sensitive 500 microamp meter that is suppressed by CR4 and R7. See schematic.

Should it ever become necessary to replace any of these components, the suppression of M1 may be disturbed. The procedure for re-calibrating is as follows:

1. Make certain that CR4 is connected in a forward direction (CR4 negative lead to M1 negative terminal) and that R7 is at maximum resistance. (Full one thousand ohms in series with M1.)

2. Connect a 175 thousand ohm resistor (250 thousand ohm Pot. adjusted to 175 thousand ohms with an accurate ohmmeter) from cathode to G2 (Pin #11 and Pin #10 on the 12 pin CRT socket).

3. Connect CR128 to 117 volt AC. Select "EMISSION" position with the function switch. The meter should now rise. Adjust R7 until the M1 needle reads full scale, this is just at the top of the "GOOD" scale.


NOTE:
CAPACITORS IN MICRO-FARADS.
VOLTAGES TAKEN WITH RESPECT
TO JUNCTION OF R14 & R12.
R2
8.2 M
350 V
1-2 NE2
K
C2
.02
R3
100 K
200 V
G2
C3
.02
G1
R4
100 K
R5 8.2 M
3.3K
R6
NE2
1-3
FUNCTION
S1-A
OFF
SHORTS
EMIT T
CUT OFF
RMV SHTS
REJ 1
REJ 2
REJ 3
C1
R13
1K
CR 1
HI
LO1
LO2
S4
G2
1K
R7
METER ADJ
3MA F.S.
M1
500UA
CR 4
S1-B
S1-C
G1
S1-F
H
R9
47K
R10
10
NE 2
R1
100K
CR2
C4
2
R8
500
REJ.
S5
S1-D
117 VAC
50 V
27V
R11
4.7K
R14
5.6K
C5-A
2
C5-B
125
CR 3
R12
20K
GRID BIAS
-100 V
CRT SOCKETS AS
VIEWED FROM TOP
COLOR
SOCKETS
CABLE
RED
GREEN
BLACK
BROWN
RED/WHITE
GRN/WHITE
BLUE/WHITE
YELLOW
WHITE
F
BLACK
E
YELLOW
D
C
B
A
NORM
WHT
12 V
10 V
9 V
8.4 V
7 V
COLOR
6.3 V
5 V
4 V
2.7 V
2.3 V
1 V
T-1
FILAMENT
S 2
35 %
YLLO
BLK
85 %
BLK
RED
BLK
S1-E
S 6
RED
GRN
BLU
COLOR
GUN
LIFE TEST S3
CR128 SCHEMATIC

PARTS LIST

Reference	Part No.	Description	Price
C1	24G93	2 MFD 175V Electrolytic	.60
C2 & C3	24G23	.02 MFD 500V +80% -20% Disc capacitor	.25
C4	24G94	2 MFD @ 350 Electrolytic	.60
C5A & C5B	24S46	125 - 2 MFD Electrolytic 450, 250V	2.00
R7	15G20	Control 1 K Pot.	.70
R12	15G31	20 K Pot.	.70
CR1, CR2, CR3	16S9	50 ma Selenium Rectifier	.85
CR4	19G3	1N295 diode	.50
I1, I2, I3	20G1	NE2 Neon Bulb	.25
M1	B23S14	0-500 Microamp 2% Meter 300 ohms 10%	4.95
S3	25G6	SPST Slide Switch Spring return	.25
S2	25S22A	1P12P Rotary Switch	1.00
S6, S4	25G64	2P3P Slide Switch	.50
S5	25G65	1P2P Leaf Switch	1.25
S1	25G66	6P8P Rotary Switch	2.00
	26G36B	Socket & Cable Assembly (Black & White)	3.00
	26G36C	Socket & Cable Assembly (Color)	3.00
T1	28S22	Filament Transformer	4.95

ADDITIONAL COLOR PICTURE TUBE CHECK TO INSURE PROPER TRACKING

The procedure for checking picture tubes as described in previous paragraphs is normally all that is required to determine whether or not the color tube is good or bad. The color tube is checked in the same exact manner as the black and white tubes. The color gun switch allows you to check each color gun independently (as recommended by the picture tube manufacturers).

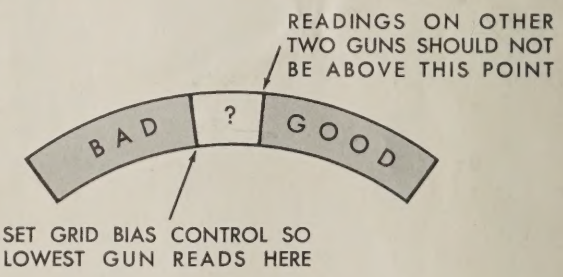
An additional check has been recommended by the manufacturers of color picture tubes to determine whether or not the tube will track properly to give a white raster at various settings of the brightness control. Your CR128 can be used to make these checks by following the manufacturers recommended procedure directly or following this simplified procedure. It is not necessary to purchase a separate picture tube checker for color tube checking only. Your CR128 uses the recommended DC on these checks and allows you to vary the bias on each gun through the use of the GRID BIAS control.

To check tracking capabilities, each gun is checked with the same applied potentials. Average beam current is approximately the same as when the CRT operates in the TV set; around the 200 microamp range. Make this check as follows after allowing 4 or 5 minutes for the CRT to warm up.

a. Set FUNCTION switch to GRID CHECK.

b. Set FILAMENT switch to COLOR and GRID BIAS control so that the meter reads near half scale.

c. Set the COLOR GUN switch to red, green and then blue. Leave the COLOR GUN switch on the lowest reading. Re-set the GRID BIAS control until the lowest reading is at the 200 micro-amp point. This is at the high end of the BAD section of the meter and the low section of the white questionable area.



d. Check the reading at the other two settings of the COLOR GUN switch. The readings on the other two guns should be in the white questionable area and not in the green GOOD area. This will indicate to you that the beam current from each gun with like potentials applied is within 150 percent of each other as recommended by the CRT manufacturers.

e. If the readings are not as recommended above, the gun with the lowest output can be rejuvenated without affecting the other two. After rejuvenation, repeat the procedure to determine whether or not all three guns fall into the white questionable area. The closer they fall to each other, the better.

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